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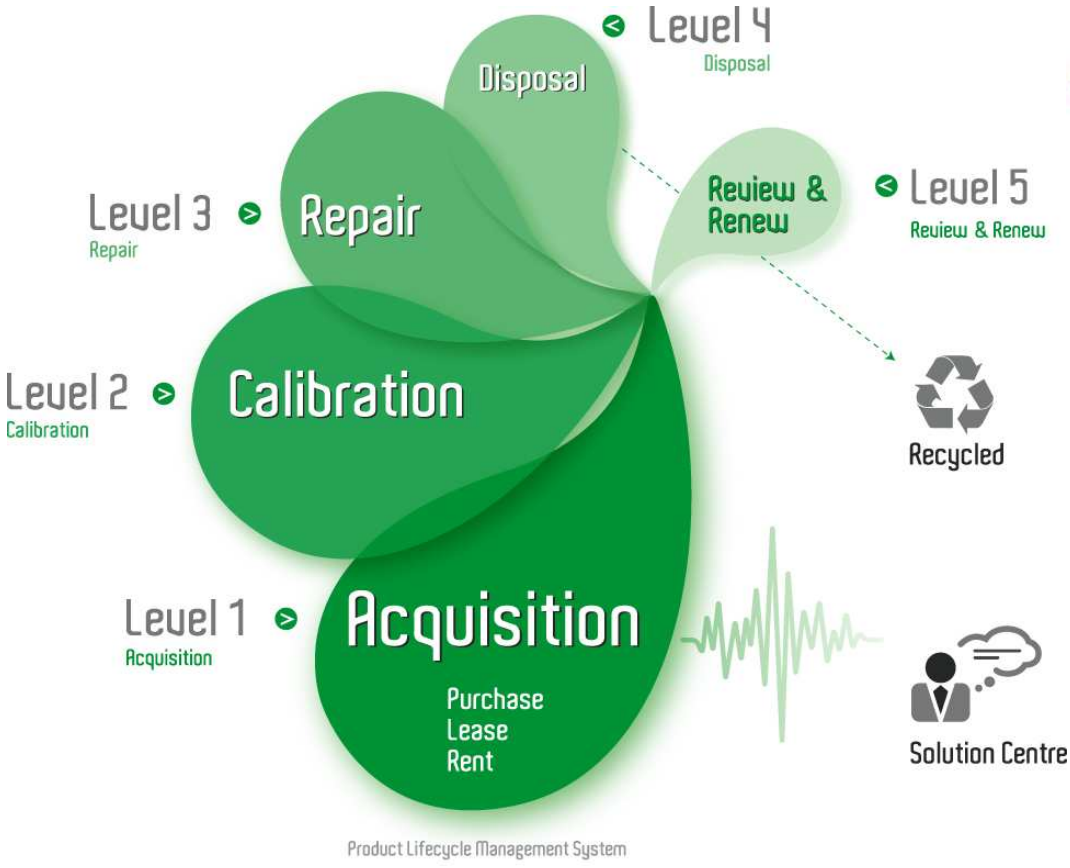

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OPTICAL TIME DOMAIN REFLECTOMETER

MW9060A

1.31/1.55 µm (SM), 0.85/1.3 µm (GI)

CE GPIB

The MW9060A is an upgraded version of the high-performance MW9040A/B OTDR. Anritsu's unique procedure and event-registration functions combine to reduce measurement time. The new unit also incorporates a 3.5" FDD and printer.
This is a universal type OTDR to be used for single mode or multimode fiber in a wide dynamic range for long distance or in a high-resolution for short distance.
There are three types of wide dynamic range plug-in unit in the single mode (1.31 µm, 1.55 µm, 1.31/1.55 µm) whose dynamic ranges are 34 dB, 32 dB, 34/32 dB, respectively. The long-distance optical fibers can be measured with high efficiency. And there are two types of high-resolution plug-in units, one is in single mode (1.31/1.55 µm) and the other is in multimode (0.85/1.30 µm). A single mode unit realizes near-end dead zone of 8 m (MW0944B high-resolution unit), and a multimode fiber unit realizes the zone of 3 m, thus making possible for fault detection from the near end.

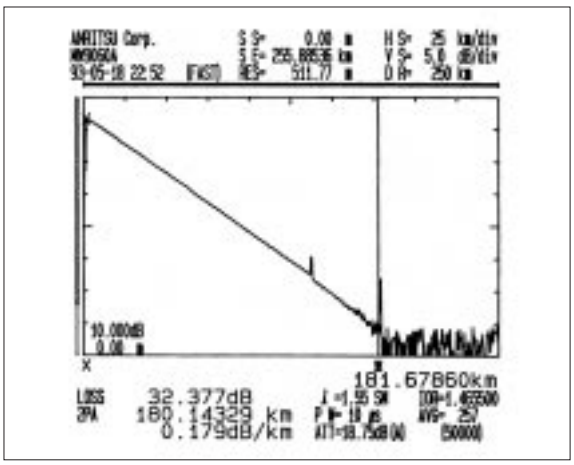
Features

- For long and short-haul, and single-mode and multimode fiber
- Fast 0.3-s sweep speed (FAST mode, 2PA mode)
- Procedure and event registration functions shorten measurement time
- Printer and 3.5" FD/PMC drives as standard equipment
- Return loss measurement

Functions and Performance

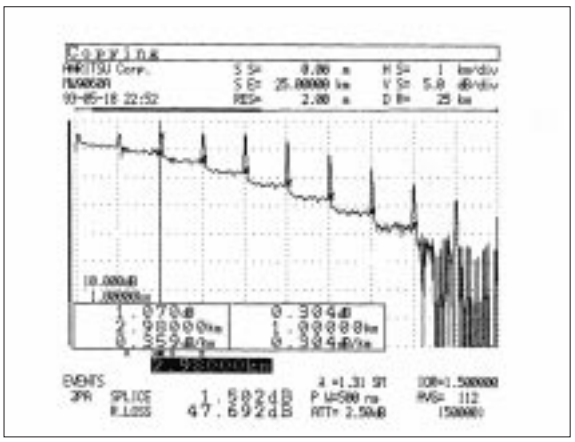
- **Measurement of long optical fibers**

The MW0945B/0946B/0947B plug-in units have a dynamic range of 34/32 dB or better (1.31/1.55 µm), for measuring long optical fibers of 180 km or more.
A measurement example for a long optical fiber with a transmission loss of 0.18 dB/km (1.55 µm) is shown below.



• High-resolution measurements
The MW0944B plug-in unit has a spatial resolution of less than 2 m and a near-end dead zone of less than 8 m, making it useful for detecting faults in short optical fibers used in buildings etc.

• Built-in high-speed printer
The image displayed on the screen can be printed in about 7 seconds at 73.1 x 57.1 mm. Averaging continues even during printing and the unit also responds to key input during printing, so there is no need to wait for printing to finish.



Copy example using event function

• PMC and FD drives
With a 512 KB PMC, 248 measured waveform screens can be recorded. The FDD uses the MS-DOS* format, so recorded data can be read on a PC. Up to 700 measured waveform screens can be recorded on one 2HD floppy disk. PMCs offer better durability than floppy disks and are very reliable even in dusty and hot environments.
*: MS-DOS is a registered trademark of Microsoft Corporation.

• Direct-plot function
Direct printing to an external printer or plotter is possible using the GPIB interface.

• Unique procedure and event registration functions
The procedure function can be used to assign operation procedures to function keys. The same operation can then be repeated just by pressing the assigned function key. In addition, event markers can be set at any point to be measured; when the LASER-ON key is pressed, the measured results are displayed in an event table according to the marker settings.

Specifications

• MW9060A (main frame)

Sweep speed		Min. 0.3 s/sweep (used in fast sweep mode and 2PA mode)
Automatic search		No. of search points: Max. 5 points (at event mode off), max. 100 points (at event mode on) Threshold (dB): 0.05, 0.1, 0.3, 1.0, 3.0, 5.0
Optical return loss measurement		Provided
Waveform comparison		Displays 2 waveforms simultaneously
Smoothing function		Improves the S/N ratio of the waveform by 6 levels from level 1 through level 6
Full-trace display function		Display the full measurement trace, measured by switching each attenuator in turn
Relative distance measurement function		Display distance relative to cursor setting
Event function		Fiber length, total loss, transmission loss, return loss for fiber on either side of splice point
Procedure function		Key command sequence is recorded and assigned to a single key for automatic execution.
Built-in memory		32 waveforms (store the setting conditions at the same time)
Memory card		Plug-in memory card, 32/64/128/256/512 KB (option)
Floppy disk*1		Micro Floppy disk, storage capacity (MS-DOS*2 formatted), 2 MB/1 MB (1.44 MB/720 KB) or 1.6 MB/1 MB (1.2 MB/720 KB)
Printer		Hard copy of screen display is available by line thermal printer.
Title display		20 characters x 2 lines
Index of refraction (IOR)		1.400000 to 1.699999 (in 0.000001 steps)
Distance display units		Meters, feet, miles
CRT		6-inch, green
Interface	GPIB	Conforms to IEE-488.1 and IEEE-448.2 Device mode: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 Controller mode: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C4, C7, E2
	Direct plot	Hard copy of the measurement screen to an external plotter/printer is available through GPIB.
Power supply		85 to 132 (170 to 250) Vac, 50/60 Hz ±5%, ≤160 VA
Temperature and humidity*3		–10° to +55°C (operate), –20° to +60°C (storage), ≤80%
Dimensions and mass		284 (W) x 177 (H) x 450 (D) mm, ≤12.5 kg (without plug-in units)
EMC*4		EN55011: 1991, Group 1, Class A EN50082-1: 1992
Safety		EN61010-1: 1993 (Installation Category II, Pollution Degree II)

*1: 1 MB/1.6 MB (720 KB/1.2 MB) capability available as option
720 KB/1.44 MB: When formatting the IBM-PC series (IBM is a registered trademark of International Business Machines Corporation)
720 KB/1.2 MB: When formatting the PC-9800 series (PC-9800 series is a product of NEC.)
*2: MS-DOS is a registered trademark of Microsoft Corporation.
*3: When plug-in memory cards (PMC) are used, the operating temperature is:
PMC left inserted: –10° to +55°C
Inserting/removing PMC: 0° to +55°C
Operating temperature when floppy disk and printer are used: +5° to +35°C
*4: Electromagnetic Compatibility

• MW0944B high-resolution unit

Wavelength*1		1310/1550 nm ±15 nm				
Fiber under measurement		10/125 µm single-mode fiber (ITU-T G.652)				
Optical connector*2		FC-PC, DIAMOND-PC, ST-PC, DIN-PC, SC-PC				
Pulse width		10 ns	20 ns	100 ns	500 ns	2 µs
Dynamic range (one-way back-scattered light level)*3,*4	Effective	6.5/4.0 dB	8.0/5.5 dB	11.5/9.0 dB	15.0/12.5 dB	18.0/15.5 dB
	SNR=1	9.5/7.0 dB	11.0/8.5 dB	14.5/12.0 dB	18.0/15.5 dB	21.0/18.5 dB
Dynamic range (4% Fresnel reflection)*4	Effective	34.5/33.0 dB				
	SNR=1	37.5/36.0 dB				
Near-end dead zone*5,*6	Fresnel reflection	3 m	5 m	13 m	55 m	220 m
	Back-scattered light	8 m	10 m	20 m	65 m	240 m
Spatial resolution*5,*7	Fresnel reflection	2 m	4 m	13 m	55 m	220 m
	Back-scattered light	2 m	4 m	15 m	60 m	220 m
Mask function*5,*8	No. of masks	5 max. (optical)				
	Mask width	13 m	13 m	18 m	65 m	240 m
Variable near-end mask width		Provided				
Variable optical output power function*8		Provided				
Distance range (km)*5		10, 25, 50, 100				
Horizontal axis*5	Scale (m/div)	2.5, 5, 10, 25, 50, 100, 250, 500, 1 km (10 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range)				
	Resolution	Sampling resolution: 5 cm to 20 m Read-out resolution: 5 cm to 200m				
	Accuracy	±1 m ±measured value (m) x 2 x 10^{-5} (does not include uncertainty in fiber index of refraction)				
Vertical axis	Scale (dB/div)	0.1, 0.25, 0.5, 1, 2.5, 5				
	Read-out resolution	0.001 dB				
	Linearity	±0.05 dB/dB				
Ambient temperature		0° to +35°C (spec. meet), –10° to +60°C(storage)				
Mass		≤2.5 kg				

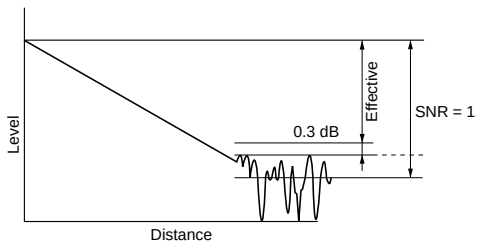
• MW0945B/0946B/0947B wide dynamic range unit

Model		MW0947B											
		MW0945B						MW0946B					
Wavelength*1		1310 nm ±15 nm						1550 nm ±15 nm					
Fiber under measurement		10/125 µm single-mode fiber (ITU-T G.652)											
Optical connector*9		FC, DIAMOND, ST, DIN, SC											
Pulse width		20 ns	100 ns	500 ns	1 µs	4 µs	10 µs	20 ns	100 ns	500 ns	1 µs	4 µs	10 µs
Dynamic range (one-way back-scattered light level)*3,*4	Effective	15 dB	20 dB	23 dB	26 dB	31 dB	34 dB	13 dB	18 dB	21 dB	24 dB	29 dB	32 dB
	SNR=1	18 dB	23 dB	26 dB	29 dB	34 dB	37 dB	16 dB	21 dB	24 dB	27 dB	32 dB	35 dB
Dynamic range (4% Fresnel reflection)*4	Effective	35 dB	39 dB	41 dB	42 dB	44 dB	45 dB	34 dB	38 dB	40 dB	41 dB	43 dB	44 dB
	SNR=1	38 dB	42 dB	44 dB	45 dB	47 dB	48 dB	37 dB	41 dB	43 dB	44 dB	46 dB	47 dB
Near-end dead zone*5,*6	Fresnel reflection	35 m	50 m	95 m	200 m	700 m	1500 m	35 m	50 m	95 m	200 m	700 m	1500 m
	Back-scattered light	35 m	50 m	95 m	200 m	700 m	1500 m	35 m	50 m	95 m	200 m	700 m	1500 m
Spatial resolution*5,*7	Fresnel reflection	15 m	30 m	75 m	150 m	500 m	1500 m	15 m	30 m	75 m	150 m	500 m	1500 m
	Back-scattered light	30 m	50 m	90 m	200 m	700 m	1500 m	30 m	50 m	90 m	200 m	700 m	1500 m
Mask function*5,*8	No. of masks	5 max. (optical)											
	Mask width	75 m	75 m	150 m	200 m	700 m	1500 m	75 m	75 m	150 m	200 m	700 m	1500 m
Variable optical output power function*8		Provided											
Distance range (km)*5		10, 25, 50, 100, 250											
Horizontal axis*5	Scale (m/div)	5, 10, 25, 50, 100, 250, 500, 1 km (10 km range) 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range) 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range) 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range) 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km, 25 km (250 km range)											
	Resolution	Sampling resolution: 10 cm to 50 m, Read-out resolution: 10 cm to 500 m											
	Accuracy	±1 m ±measured value (m) x 2 x 10^{-5} (does not include uncertainty in fiber index of refraction)											
Vertical axis	Scale (dB/div)	0.1, 0.25, 0.5, 1, 2.5, 5											
	Read-out resolution	0.001 dB											
	Linearity	±0.03 dB/dB											
Ambient temperature		–10° to +55°C (spec. meet), –40° to +75°C (storage)											
Mass		≤2.5 kg											

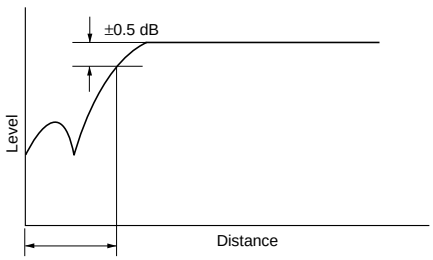
• MW0967B high-resolution unit

Wavelength*1		850/1300 nm ±15 nm				
Fiber under measurement*10		50/125 µm GI multimode fiber (NA0.2) ★ITU-T G.651				
Optical connector*11		FC, DIAMOND, ST, DIN, SC				
Pulse width		5 ns	20 ns	100 ns	500 ns	2 µs
Dynamic range one-way back-scattered light level*3,*4	Effective	9.0/7.0 dB	12.0/10.0 dB	15.5/13.5 dB	19.0/17.0 dB	21.5/20.0 dB
	SNR=1	12.0/10.0 dB	15.0/13.0 dB	18.5/16.5 dB	22.0/20.0 dB	24.5/23.0 dB
Dynamic range (4% Fresnel reflection)*4	Effective	27/29 dB	29/31 dB			
	SNR=1	30/32 dB	32/34 dB			
Near-end dead zone*5,*6	Fresnel reflection	1.5 m	1.5 m	1.5 m	1.5 m	1.5 m
	Back-scattered light	3 m	4.5 m	15 m	60 m	220 m
Spatial resolution*5,*7	Fresnel reflection	2 m	4 m	15 m	60 m	220 m
	Back-scattered light	2 m	4 m	15 m	60 m	220 m
Mask function		Not provided				
Variable optical output power function		Provided				
Distance range (km)*5		10, 25, 50, 100				
Horizontal axis*5	Scale (m/div)	2.5, 5, 10, 25, 50, 100, 250, 500, 1 km (10 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range)				
	Resolution	Sampling resolution: 5 cm to 20 m Read-out resolution: 5 cm to 200 m				
	Accuracy	±1m ±measured value (m) x 2 x 10^{-5} (does not include uncertainty fiber index of refraction)				
Vertical axis	Scale (dB/div)	0.1, 0.25, 0.5, 1, 2.5, 5				
	Readout resolution	0.001 dB				
	Linearity	±0.05 dB/dB				
Ambient temperature		–10° to +55°C (spec. meet), –40° to +75°C (storage)				
Mass		≤2.5 kg				

★1: Not applicable in the variable optical output power mode
★2: Please specify one of these types when ordering. Please contact us for other connectors. (However, the dynamic range is degraded by 0.5 dB for DIAMOND and D4 connectors.)
★3: Dynamic range (one-way back-scattered light)
Effective: The difference between the level of the point which is 0.3 dB higher than the peak noise level and the level of the point where near-end back-scattering occurs.
SNR=1: The level difference between the RMS noise level and the level where near end back-scattering occurs.



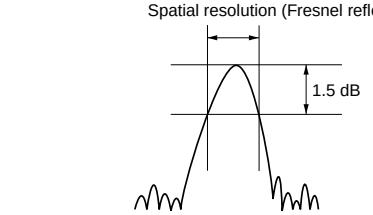
★4: Values are obtained using smoothing (level 6). With no smoothing, all values are reduced by 2 dB.
★5: When the index of refraction is set to 1.500000.
★6: Near-end dead zone
Fresnel reflection: The minimum distance at which the 4% Fresnel reflection generated by the fault can be detected. (MW0944B with built-in variable optical output power function used.)
Back-scattered light: The near-end dead zone (for back-scattered light) is the distance at which the near-end back-scattered light level approaches ±0.5 dB of its final value. — For the MW0944B: This specification represents the values for the FC-PC connector (when return loss ≥25 dB). When a fiber with an FC connector (flat polished) is measured, the dead zone may be larger than the specified value. The variable near-end mask width function can be used to suppress dead zone widening to 2 to 3 m.

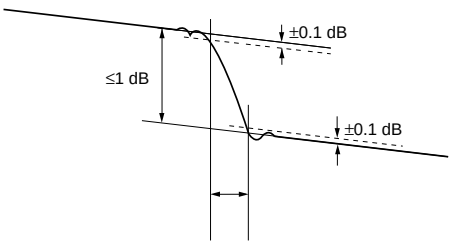


Dead zone (back-scattered light)

★7: Spatial resolution
Fresnel reflection: The width of an unsaturated Fresnel reflection pulse at the point that is 1.5 dB less than the peak value.
Back-scattered light: The distance between the points where the beginning and ending levels at a splice etc. (≤1 dB) are within ±0.1 dB of their initial and final values, respectively.

Spatial resolution (Fresnel reflection)





Spatial resolution (back-scattered light)

★8: All masks including the near-end mask (except MW0945B, MW0946B and MW0947B) are OFF in the variable optical output mode.
★9: Please specify one of these types when ordering. Please contact us for other connectors. (However, the dynamic range is degraded by 0.5 dB for DIAMOND, D4, and AT&T Biconic connectors.)
★10: The dynamic range is increased by about 1.5 dB when measuring 62.5/125 µm (NA 0.29) fibers. The transmission loss measurement result may differ from that obtained with NA 0.29 by as much as 0.1 dB/km.
★11: Please specify one of these types when ordering. Please contact us for other connectors.

Ordering information

Please specify model/order number, name and quantity when ordering.

Model/order No.	Name	
	Main frame	
MW9060A	Optical Time Domain Reflectometer	
	Plug-in units	
MW0944B	SMF 1.31/1.55 µm Unit (short distance, high resolution)	
MW0945B	SMF 1.31 µm Unit (long distance, wide-dynamic range measurement)	
MW0946B	SMF 1.55 µm Unit (long distance, wide-dynamic range measurement)	
MW0947B	SMF 1.31/1.55 µm Unit (long distance, wide-dynamic range measurement)	
MW0967B	GIF 0.85/1.30 µm Unit (short distance, high resolution)	
	Standard accessories (main frame)	
J0017	Power cord, 2.5 m:	1 pc
F0013	Fuse, 5 A:	2 pcs
Z0240	Thermal roll paper (2 rolls/set):	2 sets
W0667AE	MW9060A operation manual:	1 copy
W0667BE	MW9060A service manual:	1 copy
	Standard accessories (plug-in unit)	
B0346	Unit adaptor (for unit installation):	1 pc/1 unit
W0719BE	MW0944B service manual (for MW0944B):	1 copy
W0720BE	MW0945B/0946B/0947B service manual (for MW0945B/0946B/0947B):	1 copy
W0721BE	MW0967B service manual (for MW0967B):	1 copy
	Options (main frame)	
MW9060A-01	GPIB interface	
MW9060A-02	1.2 MB FDD (conforming to NEC PC-9800 series format)	
	Options (plug-in unit)	
MW09[ ][ ]-21	D4 connector	
MW09[ ][ ]-22	AT&T Biconic connector (unavailable for the MW0944B)	
MW0967B-23	Amphenol 906	
MW09[ ][ ]-37	FC-PC connector (unavailable for the MW0944B/0967B)	

Model/order No.	Name	
	Optional accessories	
B0293	CRT hood	
P0005	Memory card (RAM: 32 KB)	
P0006	Memory card (RAM: 64 KB)	
P0007	Memory card (RAM: 128 KB)	
P0008	Memory card (RAM: 256 KB)	
P0009	Memory card (RAM: 512 KB)	
J0007	GPIB cable, 1 m	
J0008	GPIB cable, 2 m	
J0057	Optical adaptor, FC type	
J0200[*]	FC-FC-[*]M-GI (FC optical fiber cord, [*] m, GI)	
J0056[*]	FC-FC-[*]M-SM (FC optical fiber cord, [*] m, SM)	
J0087[*]	FC-D4-[*]M-GI (FC-D4 optical conversion cord, [*] m, GI)	
J0210[*]	FC-D4-[*]M-SM (FC-D4 optical conversion cord, [*] m, SM)	
J0209[*]	FC-BIC-[*]M-GI (FC-BICONIC optical conversion cord, [*] m, GI)	
J0208[*]	FC-BIC-[*]M-GI (FC-BICONIC optical conversion cord, [*] m, GI)	
J0207[*]	FC-DIA-[*]M-GI (FC-DIAMOND optical conversion cord, [*] m, GI)	
J0206[*]	FC·PC-DIA·PC-[*]M-SM (FC·PC-DIAMOND·PC optical conversion cord, [*]m, SM)	
J0516[*]	FC-DIN-[*]M-GI (FC-DIN optical conversion cord, [*] m, GI)	
J0517[*]	FC-DIN-[*]M-SM (FC-DIN optical conversion cord, [*] m, SM)	
J0518[*]	FC-ST-[*]M-GI (FC-ST optical conversion cord, [*] m, GI)	
J0519[*]	FC-ST-[*]M-SM (FC-ST optical conversion cord, [*] m, SM)	
J0520[*]	FC-SC-[*]M-GI (FC-SC optical conversion cord, [*] m, GI)	
J0521[*]	FC-SC-[*]M-SM (FC-SC optical conversion cord, [*] m, SM)	
MZ8012A	Connector Cleaning Set	
B0329K	Protective cover (for front panel)	
Z0245	Carrying case for plug-in unit (hard type)	
Z0246	Carrying case for plug-in unit (soft type)	
	Peripherals	
MA9014A	Bare Fiber Connector (common use for SM and GI fiber)	
MA9013A	Fiber Adaptor	
MN9607A	SM/GI Converter	
FP-850	Printer (EPSON product)	
VP-850	Printer (EPSON product)	
HP2225AJ	Printer (HP product)	
GD9411F-1-11	Plotter (Graphtec product)	
HP7550A	Plotter (HP product)	
	Supplies	
Z0168	3.5” mini floppy disk (2HD):	10 pcs/set
Z0054	3.5” mini floppy disk (2DD):	10 pcs/set

[*]: These lengths are expressed by symbols A, B and C in the order number, for example; J0200A, B or C, where A=1 m, B=2 m, C=3 m.